DOCUMENT RESUME

ED 417 068 SE 061 129

| | |
|---|---|
| TITLE | Fractions: Activities and Exercises for Teaching Fractions in Secondary Schools. Series of Caribbean Volunteer Publications, No. 4. |
| INSTITUTION | Voluntary Services Overseas, Castries (St. Lucia). |
| PUB DATE | 1997-00-00 |
| NOTE | 48p.; Production funded by a grant from British Development Division, Caribbean. |
| AVAILABLE FROM | VSO Resource Centre, 317 Putney Bridge Road, London SW 15 2PN, England, United Kingdom. |
| PUB TYPE | Guides - Classroom - Teacher (052) |
| EDRS PRICE | MF01/PC02 Plus Postage. |
| DESCRIPTORS | *Experiential Learning; Foreign Countries; *Fractions; Learning Activities; Mathematics Education; Mathematics Instruction; Relevance (Education); Secondary Education; Teaching Methods |
| IDENTIFIERS | Saint Vincent |

ABSTRACT

This document contains materials from a half day workshop held at Petit Secondary School for mathematics teachers at Petit Bordel and Troumaca Ontario Secondary School on the island of St. Vincent in the Caribbean. This book advocates the use of activity-based mathematics as a teaching methodology in secondary schools and demonstrates the use of proprietary and 'home produced' resources. Objectives of this workshop included examining various means of teaching fractions to secondary students, particularly those at the lower school level and to give concrete realization to the abstract teaching approach found in most mathematics textbooks. (ASK)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

SE

ED 417 068

VSO

# Fractions: Activities and Exercises for Teaching Fractions in Secondary Schools

Series of Caribbean Volunteer Publications

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

J. Haysdale

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

One of a series of publications produced by VSO volunteers in the Caribbean. Production funded by a grant from **British Development Division, Caribbean.**

# #4

SE 031 139

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.



BEST COPY AVAILABLE

Voluntary Services Overseas **(VSO)** is an independent British Charity which works to assist countries in the Caribbean, Africa, Asia and the Pacific to achieve their development aims and create a more equitable world. VSO volunteers work alongside people in poorer countries in order to share skills, build capabilities and promote international understanding and action.


## Copyright VSO

**Reproduction unlimited for public and educational uses - please acknowledge VSO series as source. No reproduction for commercial use without permission from VSO London.**


Further copies are available, at cost of copying, from :

VSO Field Office
73, Chaussee Road
P.O. Box 1359
Castries
St. Lucia

**( Until December 1998 )**

VSO Resource Centre
317, Putney Bridge Road
London
SW 15 2PN
England

**( From 1999 onwards )**



**BEST COPY AVAILABLE**

Notes from a

# FRACTIONS WORKSHOP

# ACKNOWLEDGEMENTS

**VSO would like to extend their appreciation and gratitude to the following people who have made this series of publications possible:**

British Development Division ( BDDC) for providing the funding for this series of publications

Volunteers and local colleagues contributing to production of publications.

Organisation of Caribbean Overseas Development (OCOD) for assisting in the reproduction of these publications



BEST COPY AVAILABLE

Other publications in this series include:

## Maths and Science

1. A Practical Workbook for CXC Biology
2. Data Analysis Questions for Science Subjects. A Resource Booklet
3. Exercises and Activities in Basic Number Work
4. Fractions. Activities and Exercises for Teaching Fractions in Secondary Schools
5. Lower School Maths. Lesson Plans and Activities for Ages 7 -9 Years.
6. Maths and Science Booklet
7. Teaching Directed Numbers at Secondary School Level
8. Teachers' Resource Material for Integrated Science. Ideas for Teaching Integrated Science in Secondary Schools.
9. Upper School Maths Lesson Plans and Activities for Ages 9 -11 Years

## Special Needs

10. An Introduction to Children with Special Needs for Teachers in Mainstream Education
11. The Alpha Centre: A Special School for Special Children. A Curriculum Checklist for Special Educational Needs.

## English Language and Literacy

12. Language and Learning. A Practical Guide to Help with Planning your Early Childhood Programme.
13. Promoting Reading and Library Use in your School: A Resource Pack.
14. Strategies for Improving Language Across the Curriculum. Ideas and Activities for Every Classroom.
15. Your School Library. How it Works and How to Keep it Working.

## Other

16. Beekeeping. A practical Guide to Beekeeping.
17. Caribbean Copy Art. A Resource Book for Teachers to Copy.
18. Methodology in Music Education.
19. Organising Workshops. A Practical Guide.

BEST COPY AVAILABLE

Many of these publications derive from projects or workshops funded through **VSO's Community Project Scheme** - an initiative also funded by grant from British Development Division, Caribbean.

CONTENTS


| TOPIC | | | PAGE |
|---|---|---|---|
| Fractions Workshop | | | 1 |
| | Background | | 1 |
| | Aims | | 1 |
| | Objectives | | 2 |
| | Rationale | | 2 |
| Introduction | | | 3 |
| Session 1 - Multilink | | | 4 |
| Session 2 - Practical Activities | | | 5 |
| | Fraction Strips & Circles | | 5 |
| | | Worksheet 1 | 6 |
| | | Worksheet 2 | 7 |
| | | Worksheet 3 | 8 |
| | | Worksheet 3 (cont) | 9 |
| | Fraction Worksheet | | 10 |
| | | Worksheet 4 | 11 |
| | Pattern Recognition | | 12 |
| | | Worksheet 5 | 13 |
| | | Worksheet 6 | 14 |
| | | Worksheet 7 | 15 |
| | | Worksheet 8 | 16 |
| | | Worksheet 9 | 17 |
| | | Worksheet 10 | 18 |
| | | Worksheet 11 | 19 |
| | Fraction Cards | | 20 |
| | | Fraction Cards (examples) | 21 |
| | Battleships | | 22 |
| | | Board A | 23 |
| | | Board B | 24 |
| Conclusion | | | 25 |
| Appendix | | | |




BEST COPY AVAILABLE

This booklet was produced by Jan Dingley VSO, following the Fractions Workshop. Printing of the booklet was funded by a grant from the Community Project Scheme, (CPS). This funding scheme was established by a joint initiative of the British Development Division in the Caribbean (BDDC) and Voluntary Service Overseas (VSO).

# FRACTIONS WORKSHOP

This is a report of a half day workshop held at Petit Bordel Secondary School for mathematics teachers from Petit Bordel and Troumaca Ontario Secondary School. Both schools are in North Leeward, a rural area in the northern part of the island of St. Vincent in the East Caribbean.

The workshop was organised by Graham Dingley, VSO maths teacher at Petit Bordel and Jan Dingley, VSO maths advisory teacher at Troumaca (and other schools in North Leeward).

This was the first mathematics workshop organised for the maths teachers in North Leeward by the two volunteers. It was decided to limit the workshop to a half day session to 'test the water'.

## BACKGROUND

The majority of the teaching (in all subjects) is very formal. The mathematics syllabus is 'heavy' and there is insufficient time to complete all the topics detailed in the syllabus. It was felt that for a variety of reasons many pupils did not enjoy their mathematics and that by attempting to introduce activity based work this would improve their motivation and hence improve their performance.

It was decided to concentrate on the one topic of fractions as it was felt that this topic lends itself to a range of practical activities. By concentrating on one topic we hoped to maintain a narrow focus to our work. We felt that there were many 'problem areas' in mathematics and that we had to concentrate on one of these to avoid losing our focus.

## AIMS

1. To encourage the use of activity based maths as a teaching methodology in secondary schools.

2. To demonstrate the use of proprietary and 'home produced' resources. (Both schools had some mathematical equipment which was provided by V.S.O. This was to be the basis of some of the work).


BEST COPY AVAILABLE

## OBJECTIVES

1. To look at various ways of teaching fractions to secondary students, particularly those in the lower school.

2. To give a concrete realisation of the abstract teaching approach of most mathematics text books. (The local text book is ST(P) Caribbean Mathematics by C.Layne, L.Bostock, S.Chandler, A.Shepherd, E.Smith).

## RATIONALE

Some of the points which we considered when looking at our objectives were:

1. Children should be active learners.
2. Mathematics is related to the practical world.
3. Activities encourage a systematic approach.
4. Group activity encourages socialisation and develops interpersonal skills.
5. Maths is fun.
6. Motivation - all the above should help to promote a positive image of maths and hence improve the motivation of students.

An interesting point is highlighted in the following quote:

"Fractions are not just an easy step from whole numbers. Their use introduces considerable problems for the child...."
K.M.Hart, CSMS Research Project.



BEST COPY AVAILABLE

## INTRODUCTION

"Pupils need many and varied experiences of a practical nature before they can understand abstract mathematical concepts and ideas"
quote: 'Multilink' Handbook

This in many ways encapsulates what this workshop is about. It is about using practical methods to teach mathematics. It is not an attempt to replace traditional methods of teaching it is meant to complement current practice. It should be seen as an enrichment to the curriculum. This type of teaching methodology allows for a more flexible approach to classroom organisation and management. The approach encourages the use of groupwork in the classroom. This has many beneficial effects since it encourages socialisation and helps develop interpersonal skills. After all in the "real" world most workplaces demand the skills of co-operation and teamwork rather than working in solitary confinement. Some of the work is open-ended rather than "closed". This makes the management of "mixed-ability" classes easier. The students can progress as far as their ability, (or time), allows. Once again this is probably a more realistic reflection of problem solving in the "real world".

Some of the work involves students "playing". The role of "play" in the learning process should not be underestimated. Dienes has demonstrated fairly conclusively that it has a very important contribution to make. At the very least it has a powerful motivating effect.

### TIMETABLE

The workshop is divided into two sessions. The first session looks at the use of some manufactured educational equipment, "Multilink", made by NES Arnold in England. The second session examines the use of some "homemade" resources. Both sessions are "hands-on". The objective is that teachers' try out the activities just as the student would. In so doing teachers will appreciate both the methodology and usefulness (or otherwise!) of the session.



BEST COPY AVAILABLE

## SESSION 1 - MULTILINK FRACTION CARDS

NB We have not given much detail here - for one reason, the Multilink cards are self-explanatory. Also, we appreciate that not all schools will possess Multilink blocks. (Whilst it would be possible to use coloured blocks, the advantage of Multilink is that the individual blocks snap together to make a solid). For those who have, read on....

Multilink consists of a set of interlocking cubes and triangular prisms in a range of different colours. The cubes and prisms can be used in a wide variety of mathematical activities. Activity cards have been developed to help the teacher make the best use of the cubes for a particular topic. The following is just a short introduction to the possibilities of using this resource to make the teaching of fractions more interesting and accessible to young students.

Pack No. / Notes

SY497/8, Early Ideas, Cards 10 - 15
Students consider multiples of unit fractions. They are also made aware that we can have fractions of irregular shapes - NOT just fractions of a pie.

SY498, Problem Solving, Cards 4, 5, 7 and 12
Students are encouraged to realise that fractions may be 'distributed' about the shape and not just form a solid block. They also discover that different fractions go together to make a whole.

Eg. $\frac{1}{4} + \frac{1}{2} + \frac{1}{8} + \frac{1}{8}$ = one whole

SY499, Equivalence cards, Not very useful!

SY500, Investigations (Junior) Cards 2, 4, 6 and 7
Open-ended investigation work. Fractions of 3-dimensional shapes.

SY501, Fractions Investigations
Further open-ended investigations - extension work.



BEST COPY AVAILABLE

## SESSION 2 - PRACTICAL

We took as our starting point for fractions the concept of dividing a whole into equal parts. Through a range of activities we aimed to give students plenty of practice at handling parts of a whole - hence the use of 'fraction strips' and 'fraction circles'.

### USING FRACTION STRIPS AND CIRCLES

The basis for this work are worksheets 1, 2 and 3. Give out the sheets containing only the Fraction Strip grid (worksheet 1). This sheet appears in many textbooks and has many uses: ask students to fill in the relevant fractions, line by line. A set of fraction strips (worksheet 2) will result showing a comparison between different fractions. Repeat with circles (worksheets 3/4).

NB. Students could work individually using the strips and/or circles. However, more discussion is generated if students work in small groups. (This also reduces the amount of resources required.)

1. Use the strips and circles to demonstrate equivalent fractions.

a) Use a ruler or strip of paper to mark the appropriate fractions (read from left to right, the vertical line marks the end of the required fraction)

b) Ask questions such as $\frac{1}{4} = \frac{?}{8}$, $\frac{2}{3} = \frac{?}{9}$ etc.... (STP Bk 1, p54)

2. Use as a basis for comparing the size of fractions. Mark the appropriate fraction as above.

Ask: which is the largest: $\frac{3}{7}$ or $\frac{4}{13}$ etc.... (STP Bk 1, p57)

3. It may be useful to cut out the strips and circles and repeat the above exercises. This gives pupils strips of paper which correspond to the required fraction. Unfortunately, it also means there are lots of strips of paper flying around!

4. Answer the following using the pieces:

a) $\frac{1}{4} + \frac{1}{8} = \frac{?}{8}$ b) $\frac{1}{2} + \frac{1}{4} = \frac{?}{4} = \frac{?}{8}$

etc.... (STP Bk 1, p61)

5. Write down as many statements as you can using the pieces, eg:

a) $\frac{1}{2}$ of $\frac{1}{4} = \frac{1}{8}$ b) $\frac{4}{12} = \frac{2}{6} = \frac{1}{3}$ c) $\frac{1}{4} + \frac{1}{8} = \frac{3}{8}$

etc.....

This should help to correct a common mistake made by pupils that:

$\frac{1}{4} - \frac{1}{4}$ does not equal $\frac{2}{8}$ neither does $\frac{1}{2} + \frac{1}{4} = \frac{2}{6}$

NB The examples will be of varied levels of difficulty depending on the ability of the group being taught.



BEST COPY AVAILABLE

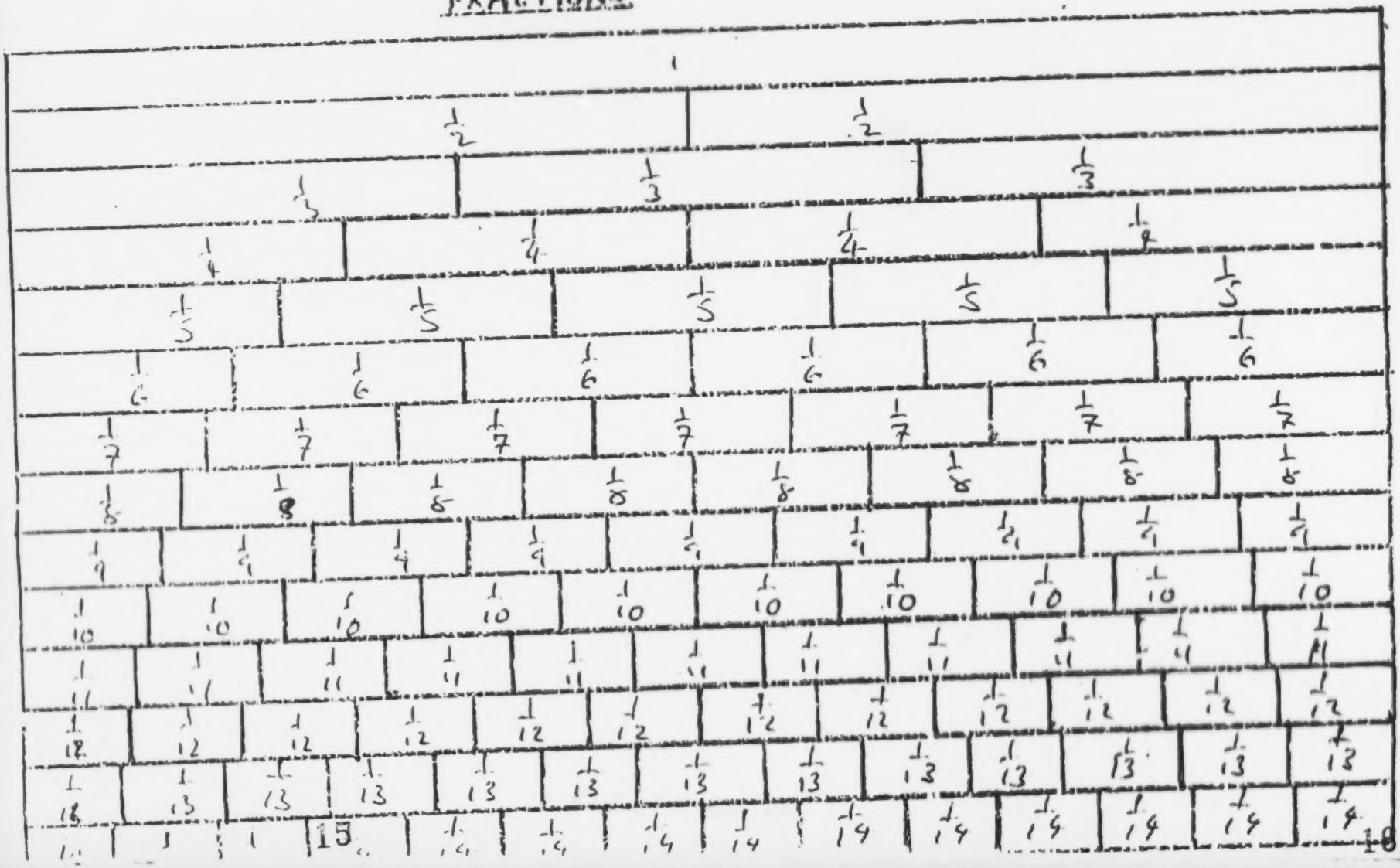
# FRACTIONS

BEST COPY AVAILABLE

BEST COPY AVAILABLE

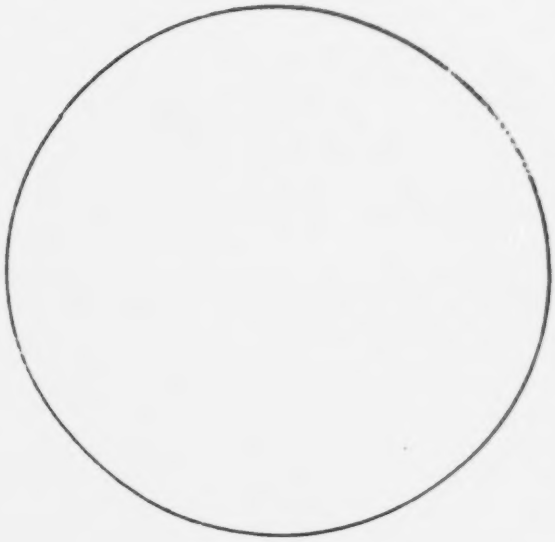


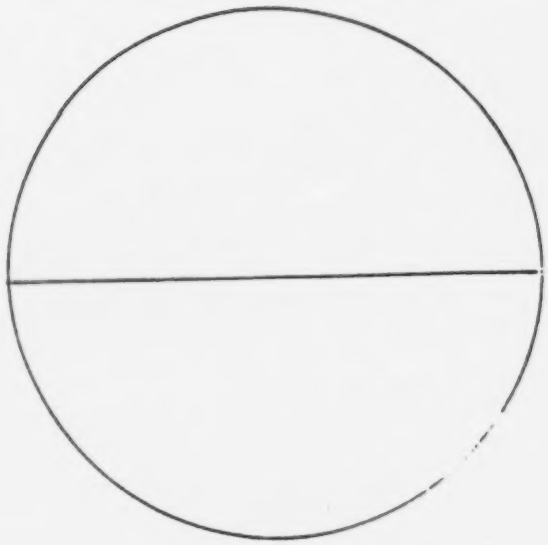
# FRACTIONS

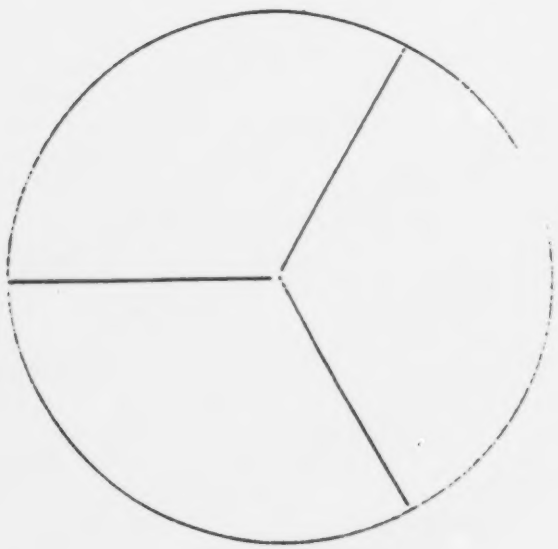


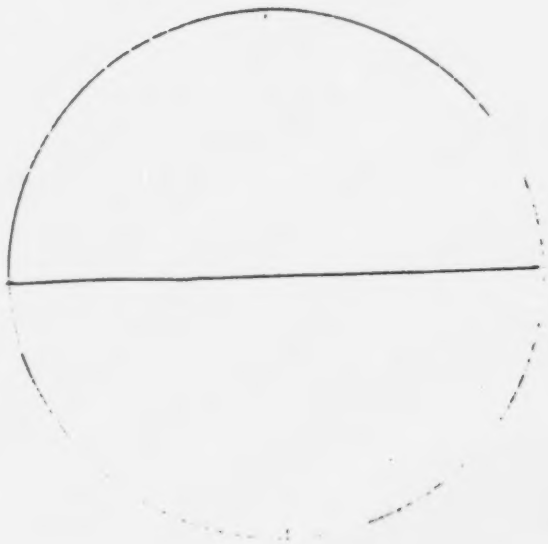
WORKSHEET 3

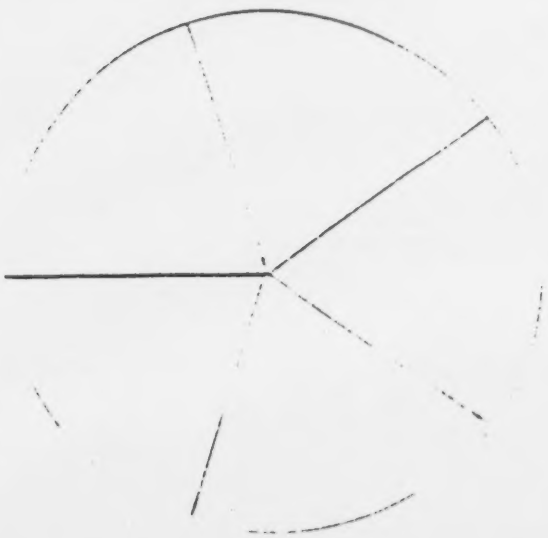
FRACTION CIRCLES

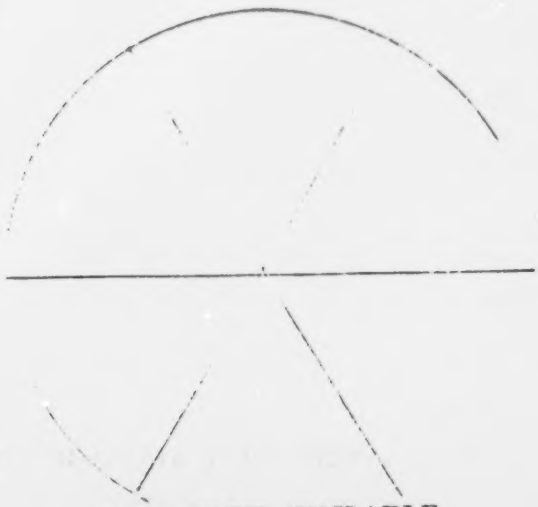






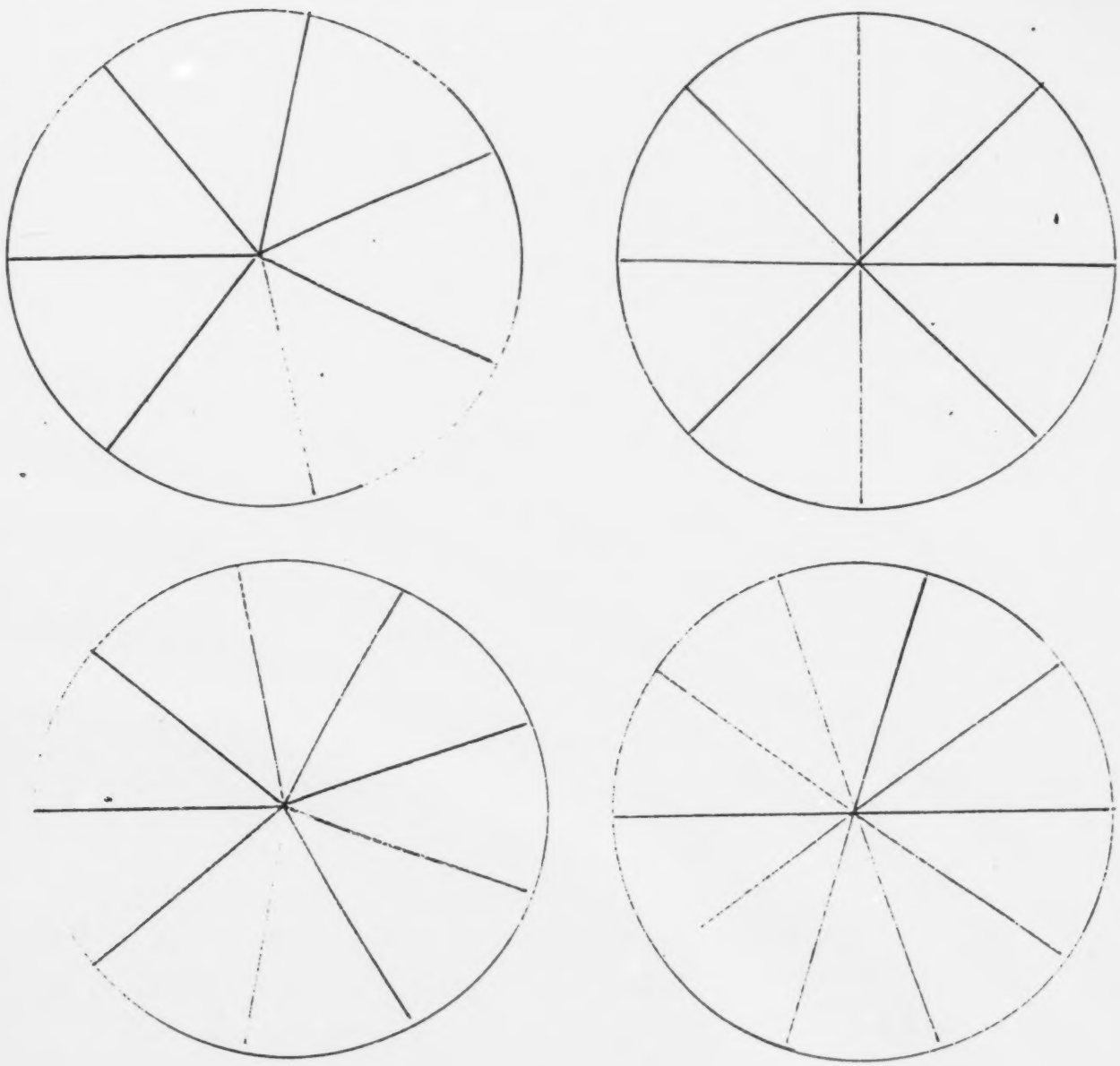








BEST COPY AVAILABLE





BEST COPY AVAILABLE

## FRACTION WORKSHEET

This sheet (worksheet 4) extends the previous work. Students need to work out the area which is shaded in Q1-10. It is useful to use the following table, especially with some of the less able children.:

| Question/ shape | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| How many parts are shaded? | | | | | | | | | | |
| How many equal parts | | | | | | | | | | |
| What fraction is shaded? | | | | | | | | | | |
| What fraction is not shaded? | | | | | | | | | | |

This table, if completed correctly, gives the fraction part automatically by reading the first two lines.

Q11-20 extend the above work as the students need to divide the shapes into the required number of parts before shading the appropriate fraction. Be particularly careful with triangular shapes and note that there is often more than one solution.

It is useful with these examples to divide the students into groups so that they can discuss their different solutions. Students can decide which solutions are correct.

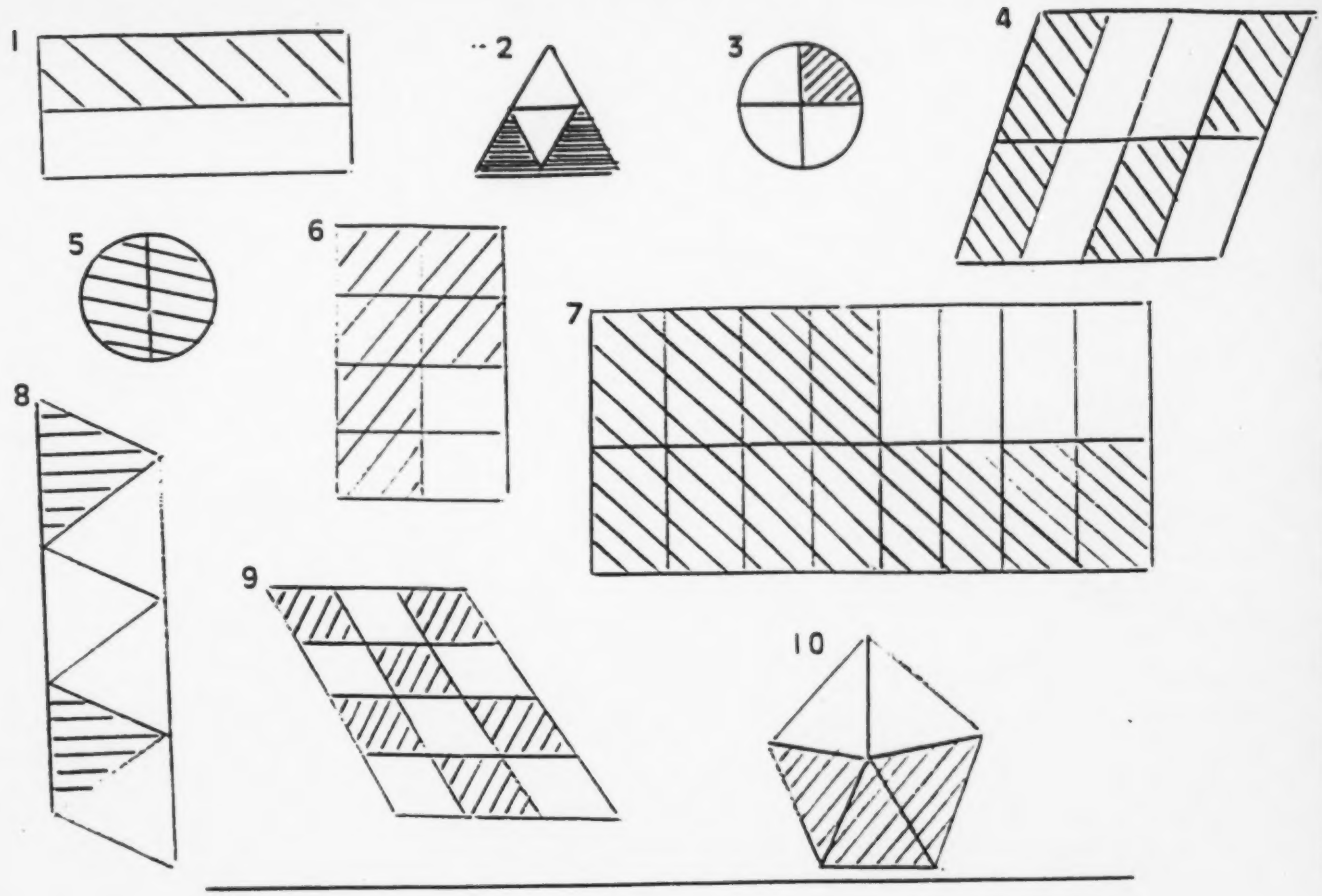
An extension to this work is to encourage students to devise their own examples and give these to other students in the class. This encourages students to consider the number of possible fractional parts that any shape can be divided into.

If crayons are available (and time) a useful exercise is to ask students to shade in the shapes once they have divided them into fractions. Ideally they should use one colour for one fractional part. This is a useful exercise in recognising patterns.

NB
If no Gestetner or Spirit Banda is available these shapes (and others) could be drawn on the board.

BEST COPY AVAILABLE

# FRACTIONS






BEST COPY AVAILABLE

## PATTERN RECOGNITION

The following sheets demonstrate different ways of dividing shapes into fractional parts and involve colouring and using cardboard shapes.

Worksheet 5 involves the division of a regular hexagon into equal parts. Once students have coloured part way down the tree they should be starting to appreciate the concept of equivalent fractions. By the base of the tree the concept of addition of fractions is being introduced.

Worksheet 6 extends this work. Students start with a small shape and build these into a larger shape made up of fractional parts. Depending on the ability level, students may find this work easier to handle if cardboard templates are made of the smaller shapes. Other students may be able to find a solution using pencil (and eraser!)

Worksheet 7 breaks a larger shape into fractional parts and gives further examples of the concept of addition of fractions.

Worksheets 8-11 extend the work giving students some thought provoking exercises which illustrate the concept that there are different ways of dividing a whole into fractional parts. Again, the use of colours would be advantageous. It is not necessary to give each of these sheets to each child - let groups work on different ones, discussing their answers between the group. The whole class can be brought together to look at the work done by the smaller groups.

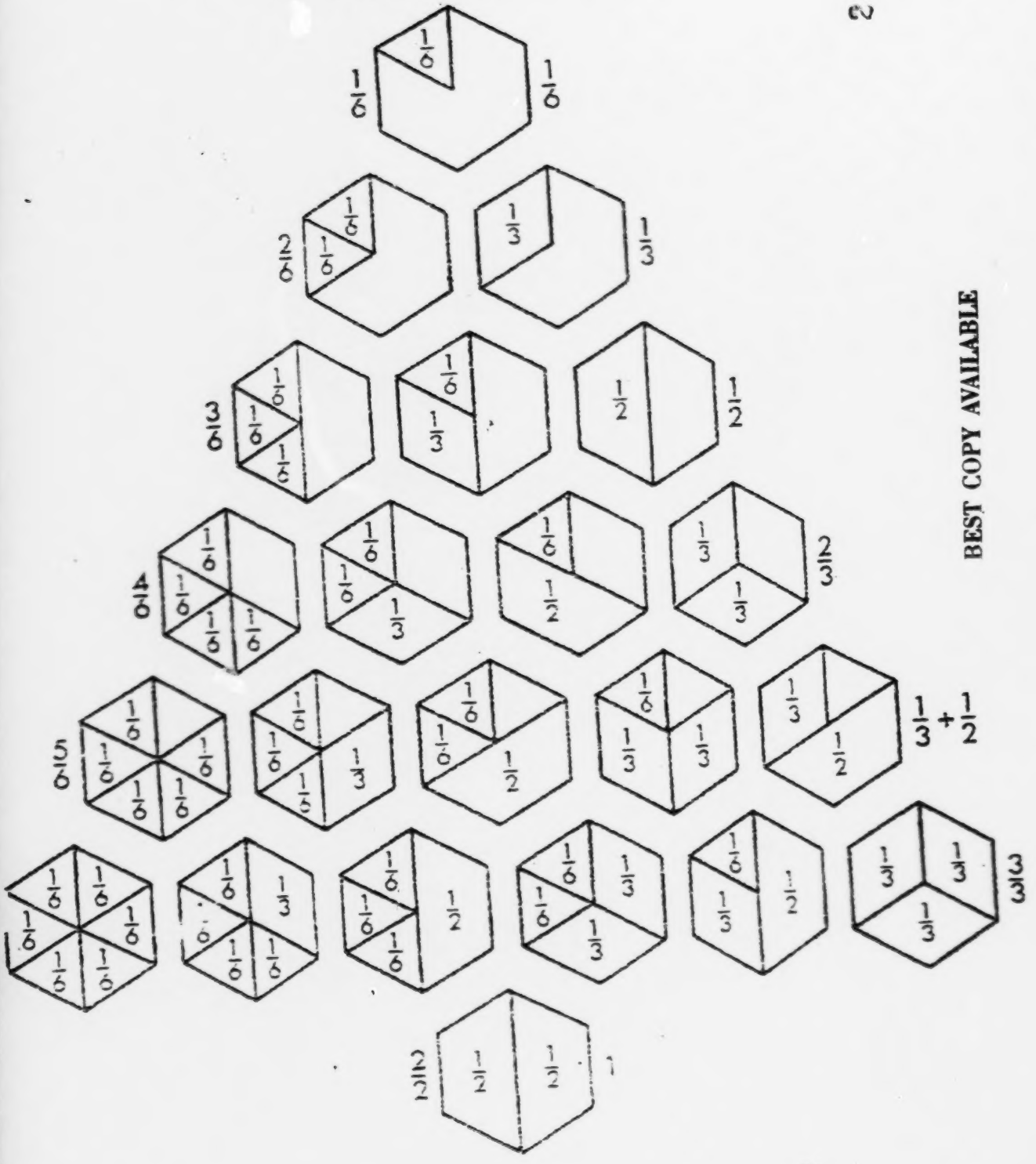
Group work is an important part of this work and students should be encouraged to work in small groups, discussing their solutions and deciding on (in)correct answers.

NB These sheets, with the correct solutions coloured, should be displayed on classroom walls - this promotes further discussion, students like to see their work displayed - and it also looks good!



BEST COPY AVAILABLE

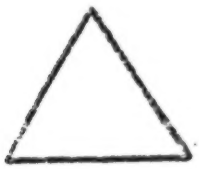
Color the fraction tree.
What pattern can you find?

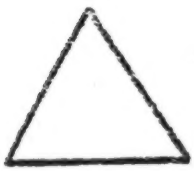


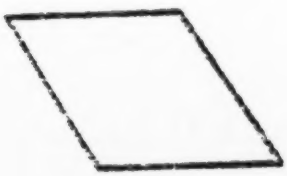

BEST COPY AVAILABLE

RKSHEET 6

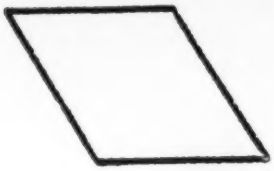
How many of these:

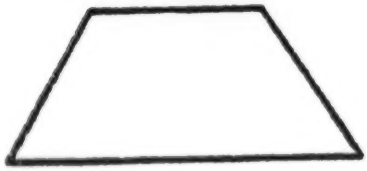


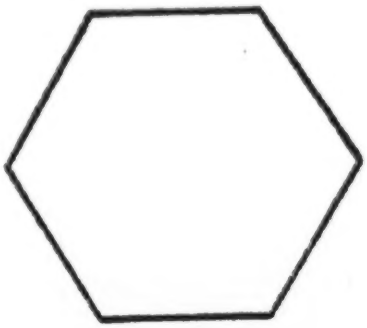


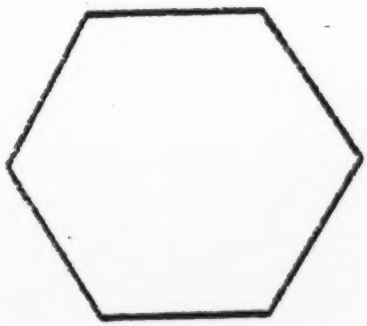


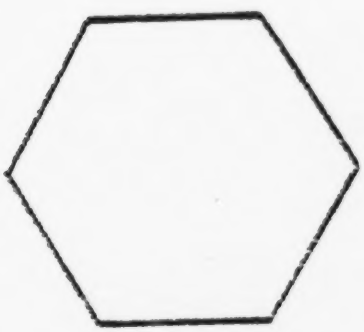
Just cover these?





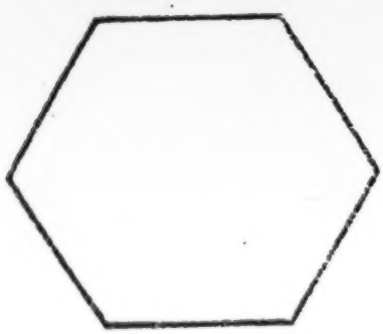




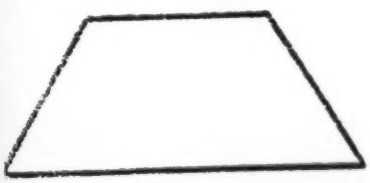


BEST COPY AVAILABLE

If the yellow hexagon is 1,

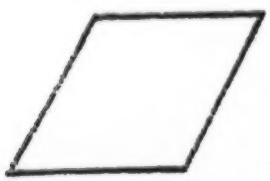


the red trapezoid is



$\frac{1}{2}$.

What is the blue rhombus?

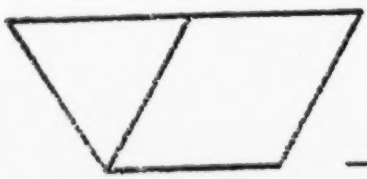


____

What is the green triangle?

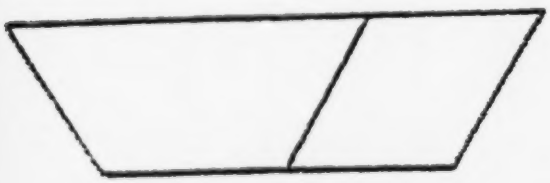
____

What are the triangle and rhombus?



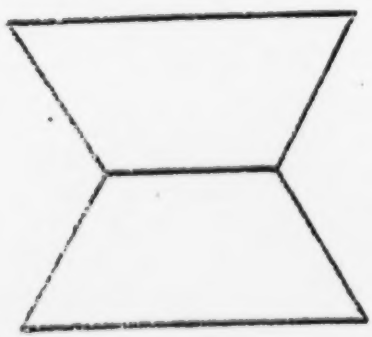
____ + ____ = ____

What are the rhombus and trapezoid?



____ + ____ = ____

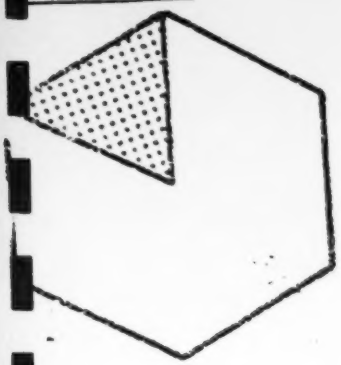
What are two trapezoids?



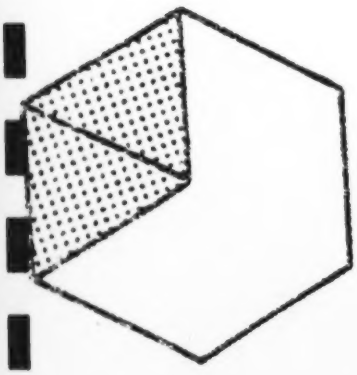
____ + ____ = ____

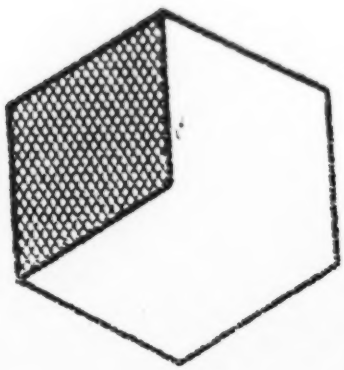
BEST COPY AVAILABLE

WORKSHEET 8



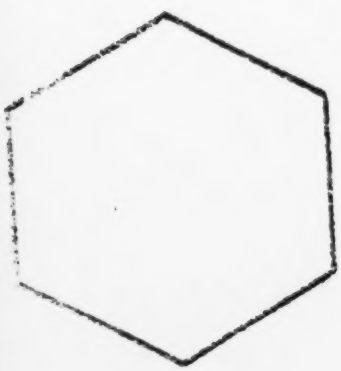
The area of the green triangle is $\frac{1}{6}$ the area of the yellow hexagon.

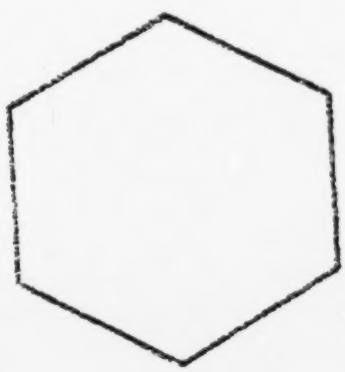




These show $\frac{2}{6}$.

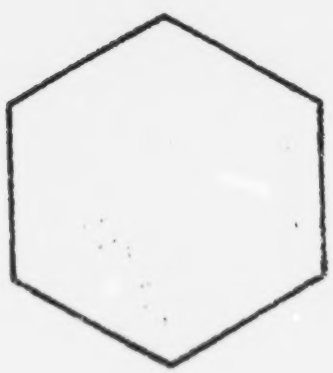
Can you show $\frac{3}{6}$ three different ways?

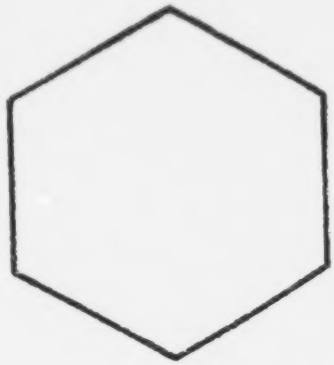


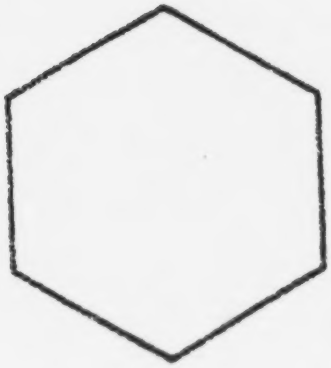


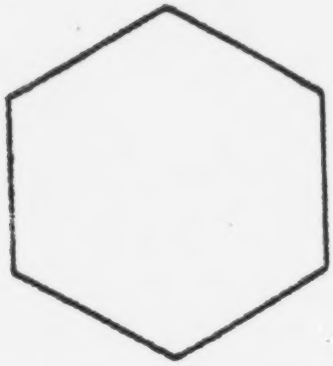
BEST COPY AVAILABLE

Can you find four *different* ways to show $\frac{4}{6}$?



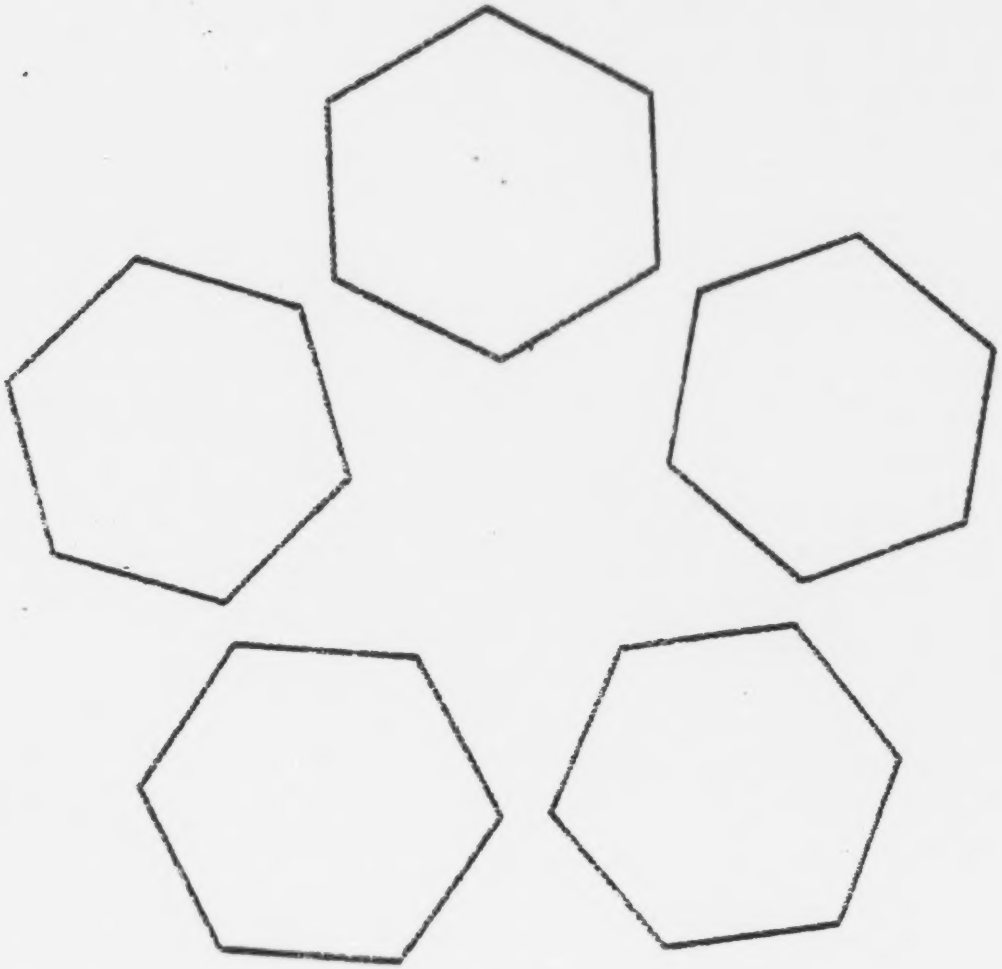


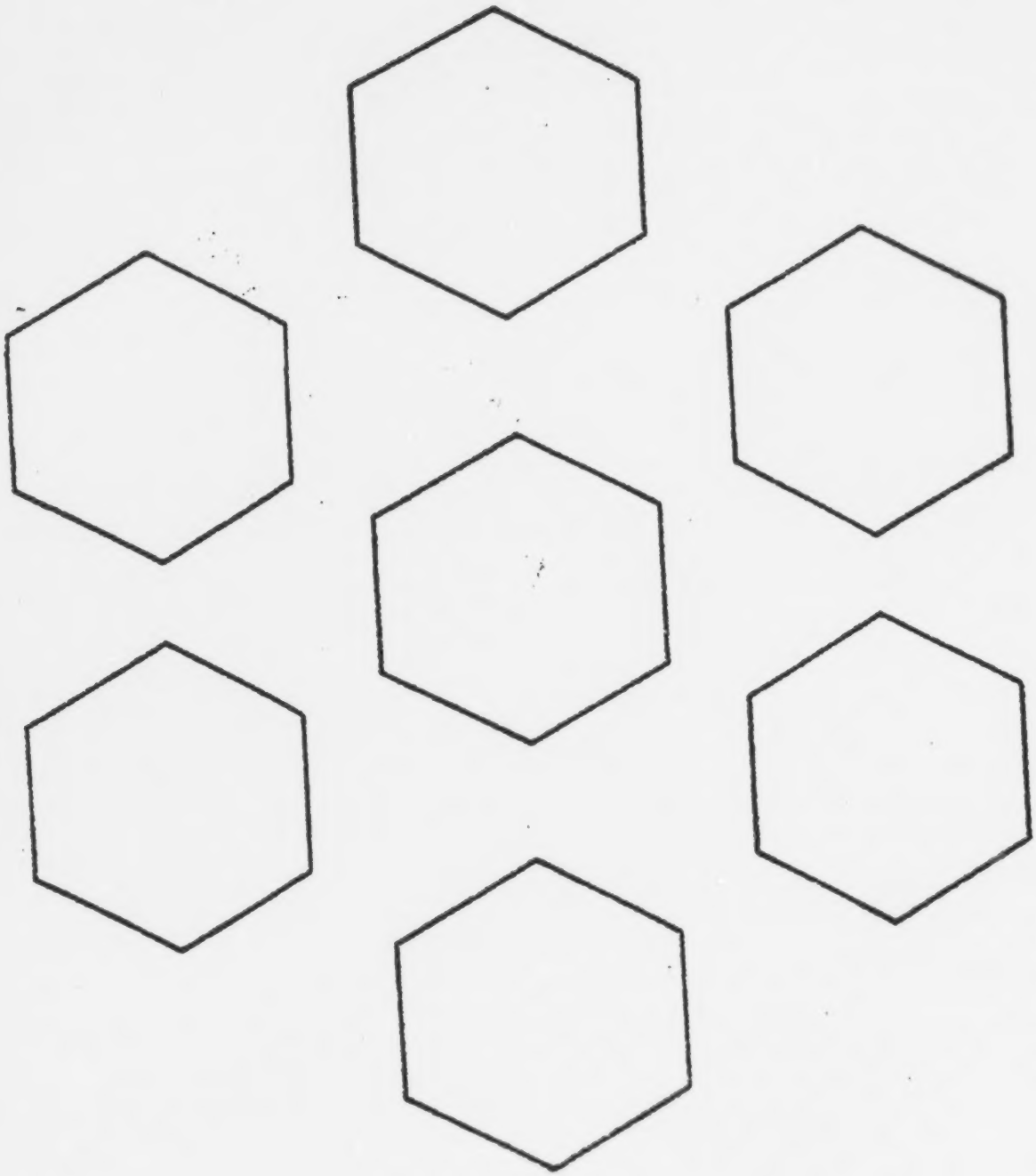




WORKSHEET 10

Can you find five *different* ways to show $\frac{5}{6}$?





Can you find seven *different* ways to show $\frac{6}{6}$?

# FRACTION CARDS

Aim:
To recognise equivalent fractions.

Materials:
One pack of fraction cards per group of 5 or 6 students.

Rules:
1. Each pack is placed face-down in the middle of the table.

2. Players take turns to pick up two cards and place them face up on the table.

3. If the cards show equivalent fractions the player keeps the pair and turns over another two cards. This player continues his/her turn until (s)he fails to find a pair.

4. All cards should be placed face-down at the end of each players turn.

5. Players take turns to select two cards, the player with the most pairs wins.

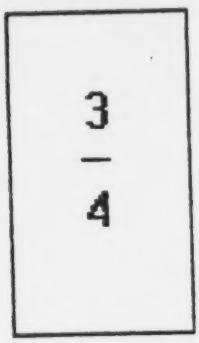
Notes:
1. Students need to remember the position of the cards on the table as well as recognising equivalent fractions.

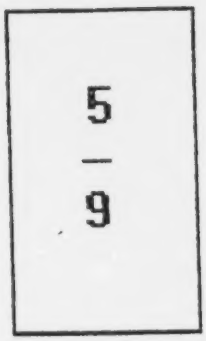
2. The first time the game is played it may be easier to place all cards face-up on the table - the students only need to consider finding pairs of equivalent fractions, not their position on the table.

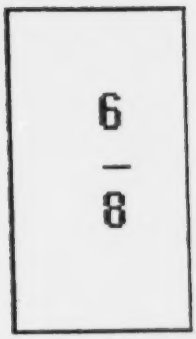


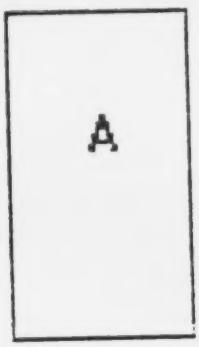
BEST COPY AVAILABLE

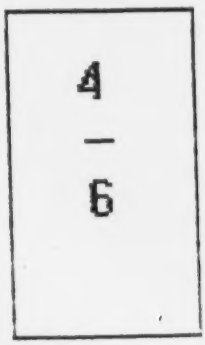
FRACTION CARDS



NOTE: The card marked A represents any card
The card marked 1 represents a whole number

Teachers will need to make sets of 20-25 cards for each group of students

eg.

$\frac{9}{12}$ $\frac{12}{12}$ $\frac{8}{9}$ $\frac{5}{10}$ $\frac{6}{9}$ $\frac{10}{12}$ $\frac{4}{5}$ $\frac{3}{6}$ $\frac{7}{9}$ $\frac{9}{12}$ $\frac{12}{15}$



BEST COPY AVAILABLE

## BATTLESHIPS

Materials:

1. Game Board A
2. Game Board B
3. Paper counters
4. 3 battleships for each player:
   - single - covers 1 square
   - double - covers 2 squares
   - treble - covers 3 squares

Rules:

1. Player A uses Game board A, player B uses board B.

2. Players sit opposite each other and place a barrier (eg a book) between them so that they cannot see each others boards.

3. Each player places the battleships on the bottom grid ('you') of the playing board. (Double and triple size ships can be placed vertically, horizontally or diagonally).

4. Player A 'fires' at the opponent by selecting a square from the top game board, calling out the name of the column and the improper fraction in the square. Player B calls out the mixed number equivalent, finds it on the bottom grid on Board B, and states if a ship (or part of a ship) is on that square.

5. If player A 'hits' a battleship then player A 'fires' again until (s)he misses. Player B then takes a turn to 'fire'.

6. Players keep a check of where they have fired by putting paper squares on the upper grid of the game board.

7. Players mark a X on the paper square when they have scored a 'hit'.

8. A game ends when one player has 'sunk' all the opponents battleships. (A ship is 'sunk' when each square it covers has been 'hit').

Extension: Students could make their own grids and fill in improper/mixed fractions, etc

NB This game can be used with different topics eg: co-ordinate geometry, directed numbers - one board displays the sum the other board displays the answer.

BEST COPY AVAILABLE

BATTLESHIPS

SHEET A

OPPONENT

| A | B | C | D | E |
|---|---|---|---|---|
| $\frac{3}{2}$ | $\frac{17}{3}$ | $\frac{11}{3}$ | $\frac{5}{4}$ | $\frac{7}{2}$ |
| $\frac{5}{3}$ | $\frac{4}{3}$ | $\frac{23}{4}$ | $\frac{9}{2}$ | $\frac{9}{4}$ |
| $\frac{19}{4}$ | $\frac{8}{3}$ | $\frac{7}{3}$ | $\frac{16}{3}$ | $\frac{10}{3}$ |
| $\frac{13}{3}$ | $\frac{15}{4}$ | $\frac{5}{2}$ | $\frac{14}{3}$ | $\frac{7}{4}$ |

YOU

| A | B | C | D | E |
|---|---|---|---|---|
| $2\frac{3}{4}$ | $5\frac{1}{2}$ | $4\frac{1}{4}$ | $5\frac{1}{5}$ | $3\frac{1}{4}$ |
| $6\frac{1}{2}$ | $7\frac{1}{3}$ | $6\frac{1}{4}$ | $6\frac{2}{3}$ | $6\frac{3}{4}$ |
| $7\frac{1}{2}$ | $7\frac{1}{4}$ | $8\frac{1}{3}$ | $8\frac{1}{4}$ | $7\frac{3}{4}$ |
| $8\frac{2}{3}$ | $8\frac{3}{4}$ | $6\frac{1}{3}$ | $7\frac{2}{3}$ | $8\frac{1}{2}$ |



BEST COPY AVAILABLE

BATTLESHIPS

SHEET B

OPPONENT

| A | B | C | D | E |
|---|---|---|---|---|
| $\frac{11}{4}$ | $\frac{11}{2}$ | $\frac{17}{4}$ | $\frac{26}{5}$ | $\frac{13}{4}$ |
| $\frac{13}{2}$ | $\frac{22}{3}$ | $\frac{25}{4}$ | $\frac{20}{3}$ | $\frac{27}{4}$ |
| $\frac{15}{2}$ | $\frac{29}{4}$ | $\frac{25}{3}$ | $\frac{33}{4}$ | $\frac{31}{4}$ |
| $\frac{26}{3}$ | $\frac{35}{4}$ | $\frac{19}{3}$ | $\frac{23}{3}$ | $\frac{17}{2}$ |

YOU

| A | B | C | D | E |
|---|---|---|---|---|
| $1\frac{1}{2}$ | $5\frac{2}{3}$ | $3\frac{2}{3}$ | $1\frac{1}{4}$ | $3\frac{1}{2}$ |
| $1\frac{2}{3}$ | $1\frac{1}{3}$ | $5\frac{3}{4}$ | $4\frac{1}{2}$ | $2\frac{1}{4}$ |
| $4\frac{3}{4}$ | $2\frac{2}{3}$ | $2\frac{1}{3}$ | $5\frac{1}{3}$ | $3\frac{1}{3}$ |
| $4\frac{1}{3}$ | $3\frac{3}{4}$ | $2\frac{1}{2}$ | $4\frac{2}{3}$ | $1\frac{3}{4}$ |

BEST COPY AVAILABLE

CONCLUSION

During the evaluation it was generally agreed that:

1. These exercises will provide a broad basis for introducing/revising work on fractions.

2. The examples provided a range of activities which would supplement the more formal aspects of the teaching of fractions.

3. We doubted if anyone would have the time to use all the sheets with one class, given the 'heavy' nature of the syllabus.

4. There are sufficient examples for the teacher to find practical work to cover a range of activities to suit individual needs.

5. The teacher will need to consider how to mix formal teaching with these activities - it was not thought that this would be a problem.

6. Teaching fractions is not easy - pupils find the topic difficult to understand.

During our 'post workshop tea' we looked briefly at some of the other exercises which had been brought to the workshop. We have included these in an appendix, with notes where necessary.

We hope that this booklet will provide a useful resource to teachers and that the examples will assist pupil's understanding of the concepts involved in learning how to handle fractions.

Workshop Members:

| | |
|---|---|
| Mr. Winsford King | Trournaca Ontario Secondary School |
| Mr. S. Jocelyn | " " " |
| Mr. V. O'Garro | " " " |
| Mr. G. Bramble | Petit Bordel Secondary School |
| Mr. T. Olivierre | " " " |
| Ms. J. Jordan | " " " |
| Mrs J. Dingley | V.S.O. |
| Mr. G. Dingley | V.S.O. |
| Mr. N. Hughes | V.S.O. |

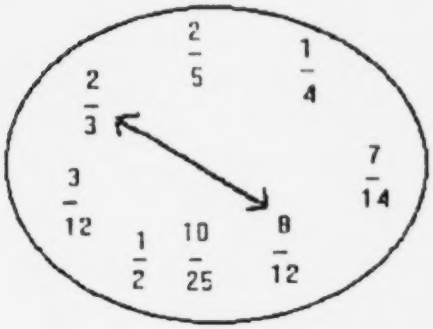


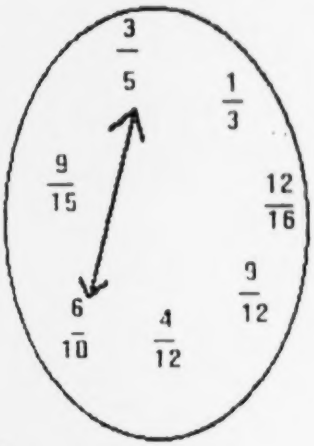
BEST COPY AVAILABLE

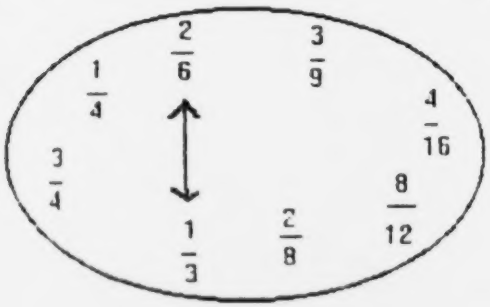
# APPENDIX

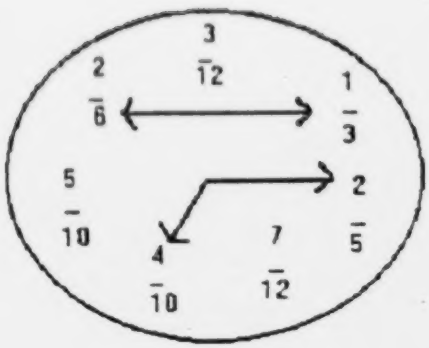
EQUIVALENT FRACTIONS

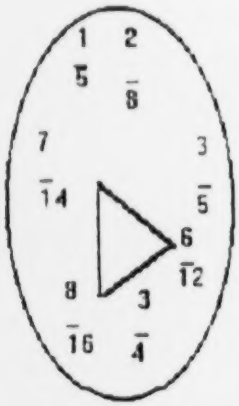
Copy and complete the following diagrams, using arrows to link equivalent fractions.




etc



BEST COPY AVAILABLE

FRACTIONS: MULTIPLICATION GRID

Perform the multiplications and complete the table below:

| x | 2/3 | 5/6 | 7/12 | 4/9 | 1/5 |
|---|---|---|---|---|---|
| 3/2 | | | | | |
| 6/5 | | | | | |
| 12/7 | | | | | |
| 9/4 | | | | | |
| 5 | | | | | |

Think carefully before you answer these questions....

1. What do you notice about the answers which lie on the diagonal?

2. Can you explain why this happens?

3. Are there other patterns/relationships?

4. Why do these occur?



BEST COPY AVAILABLE

## FRACTIONS: DIVISION GRID

Complete the following chart by dividing the fraction on the left by the fraction on the top row:

| / | 3/2 | 6/5 | 12/7 | 9/4 | 5 |
|---|---|---|---|---|---|
| 3/2 | | | | | |
| 6/5 | | | | | |
| 12/7 | | | | | |
| 9/4 | | | | | |
| 5 | | | | | |

Think carefully before you answer these questions....

1. Are there any similarities between this table and the multiplication grid?

2. Can you explain these similarities?



BEST COPY AVAILABLE

# FRACTION MAZE

There are exactly two paths from the start to the finish which TOTAL 1.

One has been started for you - can you complete it and find the other one?

| | | | FINISH ↓ |
|---|---|---|---|
| 1/10 | 1/15 | 7/30 | 1/12 |
| 7/60 | 3/20 | 1/20 | 1/4 |
| 3/60 | 2/15 | 7/60 | 2/15 |
| 1/5 - - - - - | 1/6- - - - - | 3/20 | 1/30 |
| ↑ START | | | |

Try to make another maze - use addition, or subtraction or a combination.
(Remember that if you use subtraction you will have to use mixed numbers in your maze if you want to finish on '1'.

BEST COPY AVAILABLE

# FRACTIONS ON A GEOBOARD

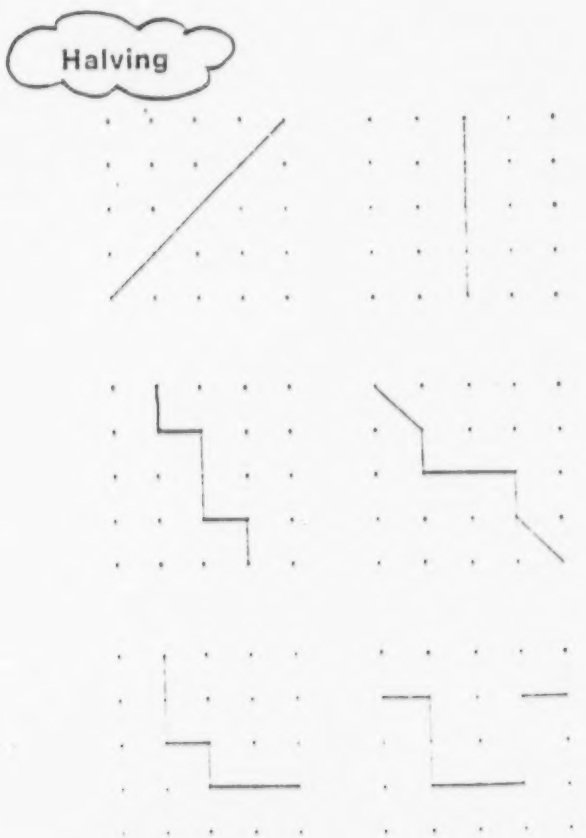
These sheets give some ideas for dividing different sized geoboards into fractional parts.
(Use spotty paper if geoboards are not available - draw spots on paper if no spotty paper!)
(Answers are given on the last page)

## 1. 4 by 4 Geoboard

Find 13 different ways of halving the board

Find 5 different ways of quartering

## 2. 5 by 5 Geoboard




BEST COPY AVAILABLE

## Quartering

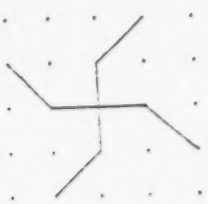
A discussion with a group of eleven-year-olds.

"Can you divide a 25-pin board into quarters using two elastic bands?"

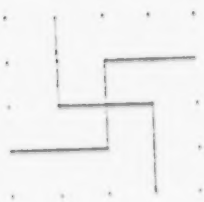
Immediately this was produced.

"Are there any more ways?"

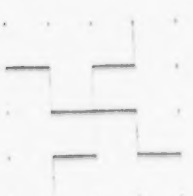
Much, much later we had this.



then more quickly these.



and after much thought and discussion these.



Could the next possibility be this?

Could we find the results obtained so far?

## Thoughts on Dissecting

Why halving and then quartering on the 25-pin board?

Could we divide the 25-pin board into three equal areas using elastic bands?

What dissections into equal areas are possible on the 25-pin board?

What dissections are possible on other boards?

## Dissecting a Rectangle with a Band

Take a rectangle on a geoboard, not too big, but not too small either as it's all too easy with a $1 \times n$ rectangle or a $2 \times 2$ square. Start with a $3 \times 2$ rectangle and a pile of bands.

Let's halve it. There are the obvious ways.

Let's "distort" these lines. The first gives these.

The second is not as productive.



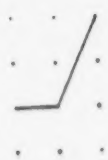


BEST COPY AVAILABLE

But are these the only solutions?

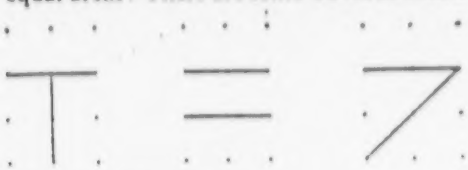
We seem to have used either both 'middle' pins or neither. What about using just one? This is one solution.

Now applying our "distortion" technique we obtain another.



Are these nine the only solutions?

Now what about dividing the rectangle into *three* equal areas? There are some obvious solutions



and a not-so-obvious solution.

We had better find some sort of strategy before the frustration becomes too acute. Let's cut off an area of 2 square units. Here are five ways of doing this.

Superimposing pairs of these where possible without overlap, and ignoring repetitions, we get these.

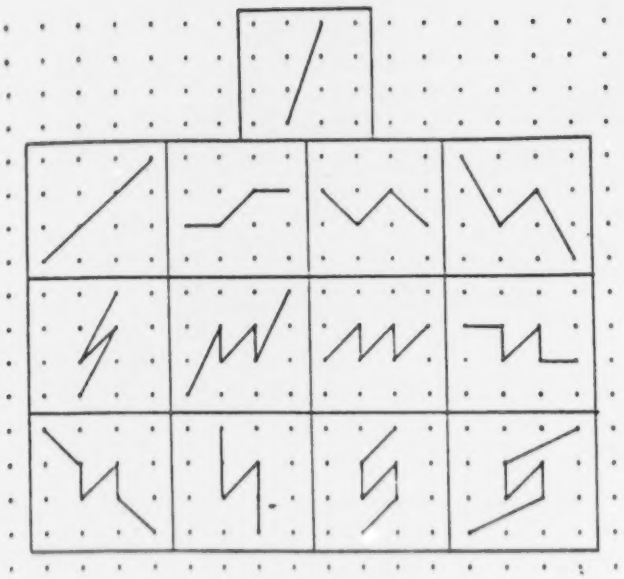
Are there any more?



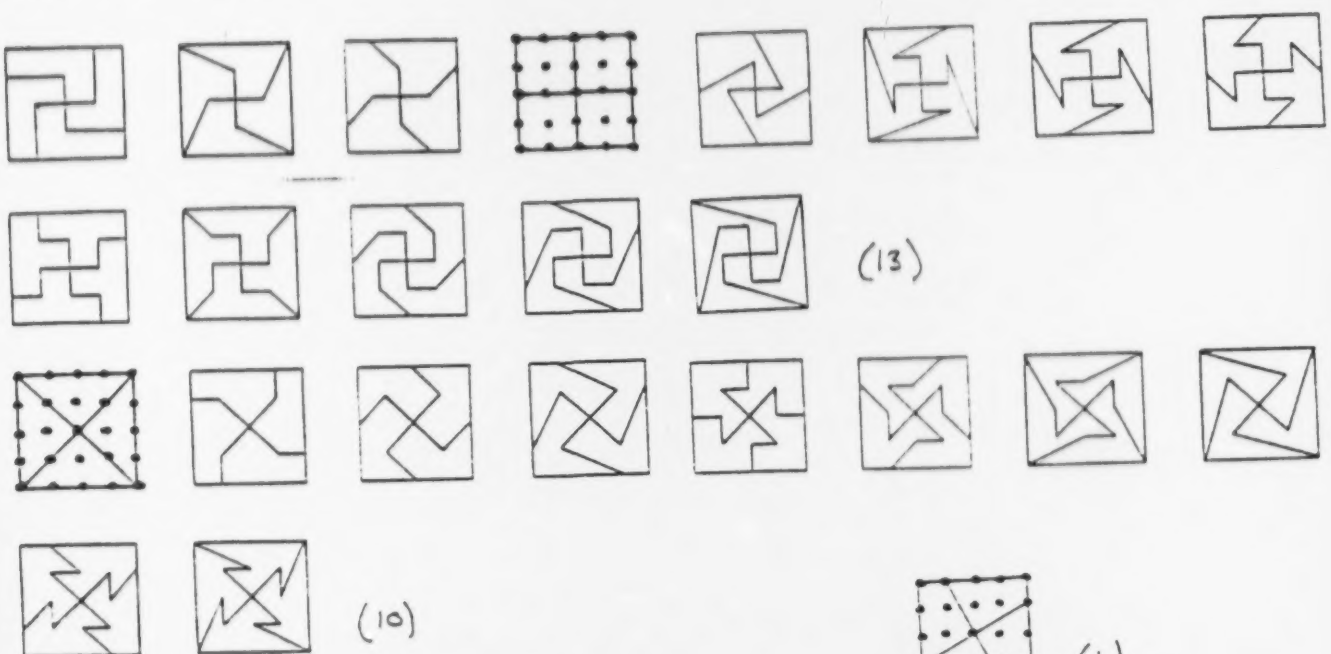
BEST COPY AVAILABLE

## HALVING, QUARTERING

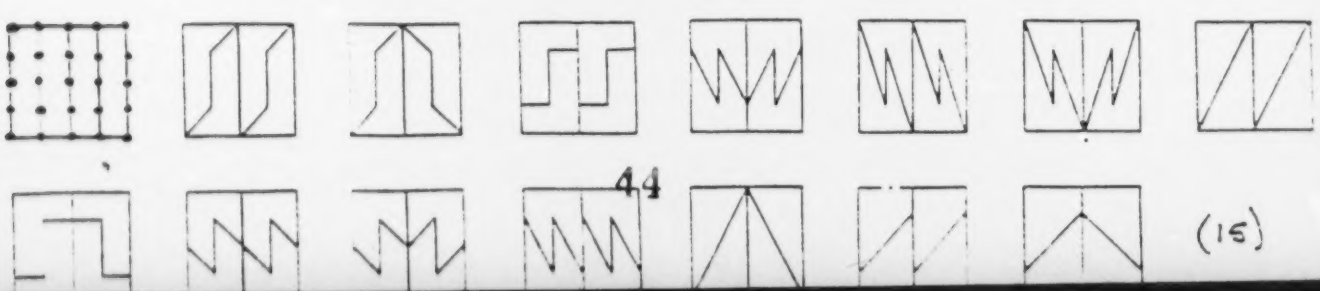
13 ways of halving a 4 x 4 geoboard



39 ways of quartering a 5 x 5




**BEST COPY AVAILABLE**



USING FLAGS

An additional exercise in fractions, which links into Geography and Social Studies is to look at the fractions which exist on the flags of different nationalities. Students will need access to an atlas or encyclopaedia to find the necessary information.

Examples

1. Poland - half is red, half is white.

2. Holland - third is red, third is white, third is blue.
(Compare with the flag if France which has the same 3 colours but not in equal parts.)

3. Mauritius - 4 equal parts, coloured red, blue, yellow, and green.

4. Austria - 2 red and 1 white stripe.

5. Nigeria - 2 green and 1 white stripe.

6. Colombia - 1 yellow, 1 blue and 1 red stripe - but the flag is not divided into thirds!

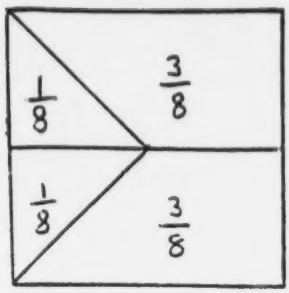
7. Ecuador - also has 1 yellow, 1 blue and 1 red stripe but again the flag is not divided into thirds.

There are many other flags which show fractions. Let students draw these and make an interesting classroom display.

(NB We have not included any visual examples as without colour these are somewhat meaningless)

## FRACTION PICTURES

**Here are some of the statements that can be made from this picture:**




1) $\frac{3}{8} + \frac{1}{8} = \frac{1}{2}$

2) $\frac{3}{8} - \frac{1}{8} = \frac{1}{4}$

3) $\frac{3}{8} \div \frac{1}{8} = 3$

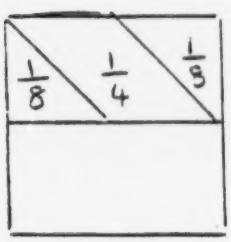
4) $(2 \times \frac{1}{8}) + (2 \times \frac{3}{8}) = 1$ whole

5) $\frac{6}{8} \div 2 = \frac{3}{8}$

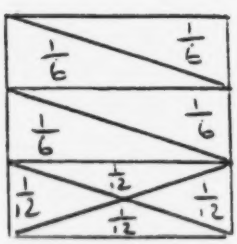
6) $\frac{1}{2} - \frac{1}{8} = \frac{3}{8}$

Make as many statements as you can about each of these pictures:

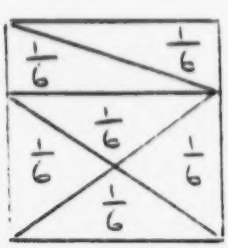
(1)



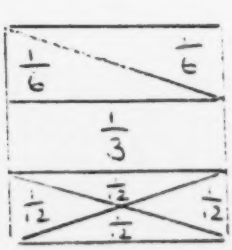

(2)



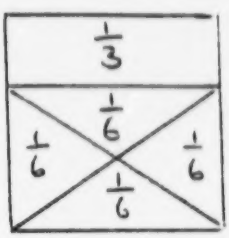

(3)



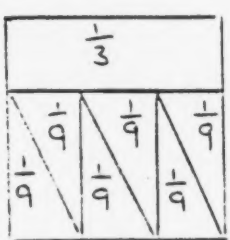

(4)



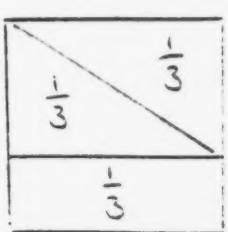

(5)



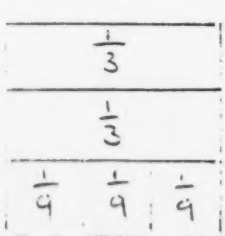

(6)




(7)




(8)



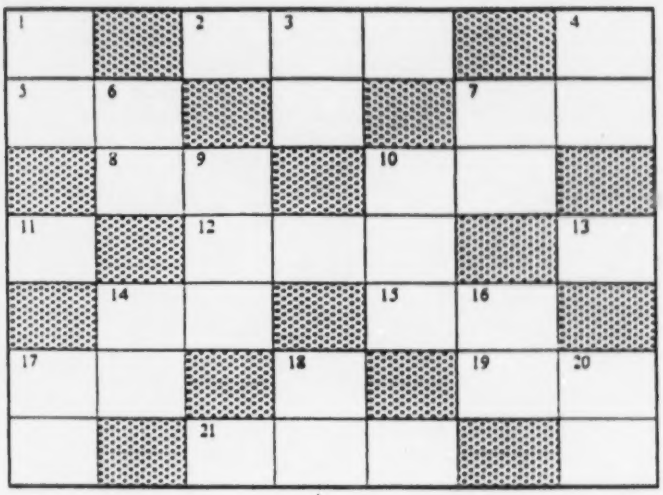



BEST COPY AVAILABLE



Draw some pictures of your own and write a statement for each one

## FRACTION 'CROSSWORD'



ACROSS

2) A quarter of 680

5) $\frac{1}{4} = \frac{*}{100}$

7) Half of 36

8) The numerator of 5 1/2 as an improper fraction.

10) $\frac{5}{4} \times 16$

11) $\frac{6}{4} = \frac{*}{2}$

12) One third of 600

13) One fifth of 20

14) $\frac{3}{20} = \frac{*}{100}$

15) 2/3 of 48

17) 3/4 of 28

19) $\frac{1}{6} = \frac{6}{*}$

21) Half of 212

DOWN

1) $\frac{26}{50} = \frac{*}{100}$

3) Half of 144

4) $\frac{9}{2} = \frac{*}{4}$

6) 6 3/8 as an improper fraction is $\frac{*}{8}$

7) $1\ 3/7 = \frac{*}{7}$

9) $1\ 25/100 = \frac{*}{100}$

10) One third of 609

14) $\frac{33}{9} = \frac{*}{3}$

16) Half of 46

17) $\frac{4}{5} = \frac{*}{20}$

18) $\frac{1}{10} = \frac{5}{*}$

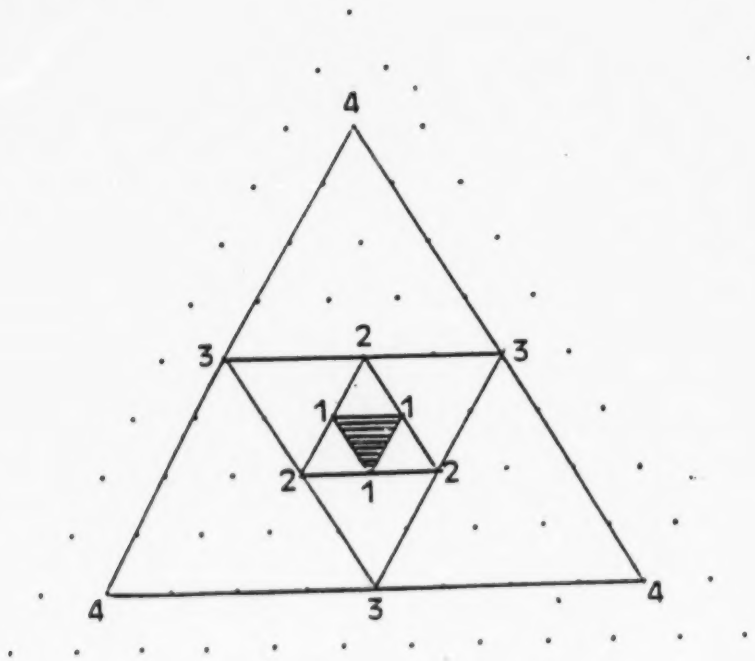
20) $\frac{2}{15} = \frac{8}{*}$



BEST COPY AVAILABLE

SHADED TRIANGLE

Look at this diagram:




The shaded triangle is 111

a) What fraction is 111 of 222?

b) What fraction is 222 of 333?

c) What fraction is 111 of 333?

d) What fraction is 111 of 444?

e) What fraction is 222 of 444?

f) What fraction is 333 of 444?

BEST COPY AVAILABLE